

## ORIGINAL ARTICLE

# FREQUENCY, STRUCTURE AND CLINICAL MANIFESTATIONS OF THERMAL BURNS OF THE JAW-FACIAL AREA IN CHILDREN

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## ABSTRACT

**The aim:** To establish the frequency, structure and features of the clinical course of facial and neck burns in children.

**Materials and methods:** During 5 years, 78 patients aged from 6 months to 15 years with isolated burns of the face and neck and in combination with lesions of other anatomical areas were treated. In the dynamics of observation of patients were used classical methods of examination, and in their treatment we followed the protocol of medical care for this category of patients.

**Results:** Thermal injuries of the face and neck accounted for 12.6% of the total number of patients with burns. Their isolated lesion was 26.9%, and in combination with other areas it was 73.1%. The most frequently affected were children of nursery, primary school and preschool age, with a predominance of rural residents (52.6%), mostly boys (78.0%). Anesthesia support had to be used in the treatment of 24 patients (30.8%). The features and nature of the burns depended on the relief of the face and the most damaged are its protruding parts.

**Conclusions:** Open flames were the most common cause of thermal burns of the face and neck in children, and the lesions were combined with burns to the chest, abdomen, and limbs. The main reasons were reckless behavior of children, their increased mobility and lack of care for their relatives. It should be noted that in 3.8% of victims there was a delay in mental and physical development.

**KEY WORDS:** children, face, neck, thermal burns

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## INTRODUCTION

Burn injury in children occurs quite often and, even a comprehensive approach to its treatment, is sometimes accompanied by a violation of the principles of the strategic line of their conduct at different stages of observation. Such situation requires the consideration of physiological and anatomical and topographic features of the structure of the child's body in different age aspects. This situation necessitates of the involvement in treatment not only directly combustiologists, but also other related specialists. The generalization of advances of the modern world medicine, accumulated in burn centers, has allowed to achieve significant success in all children's clinical institutions, thanks to which the mortality of young patients has significantly decreased recently and the results of rehabilitation measures have improved. [1,2,3,4].

The nature of the burn area determines the severity of the pain response due to local pathological disorders, which requires its timely elimination, in a cause that long-term activation of pain can lead to irreversible neurophysiological changes and disorders of homeostasis at all levels. The strongest acute pain is observed in cases of localization of burns in the maxillofacial area due to the peculiarities of nociceptive perception of the damaging

factor, and the thermal exposure is often the cause of such burns [5,6].

Burns of different size and severity occur depending on the temperature ingredient and the duration of contact with the injuring agent. It should be noted that burns of the face and neck often occur in combination with damage to other anatomical areas and vital organs, including the respiratory tract, gastrointestinal tract, cardiovascular and nervous systems, thereby causing the severity of direct pathomorphological changes in them. This is an aggravating factor in the course of burn disease, so the number of deaths with deep burns reaches about 15% [7,8].

Currently, a set of therapeutic measures is carried out in accordance with the protocol of medical care for this category of patients, but in each case its type and scope is determined individually, in depending on the clinical situation. At the same time much attention is paid to rehabilitation measures, which should be aimed at preventing rough scarring and formation after burn contractures [9,10,11].

## THE AIM

To establish the frequency, structure and features of the clinical course of facial and neck burns in children.



**Fig. 1 (a-e).** Isolated lesion of only the soft tissues of the maxillofacial area



**Fig. 2 (a-e).** Combined thermal burns, which affected other anatomical areas.

## MATERIALS AND METHODS

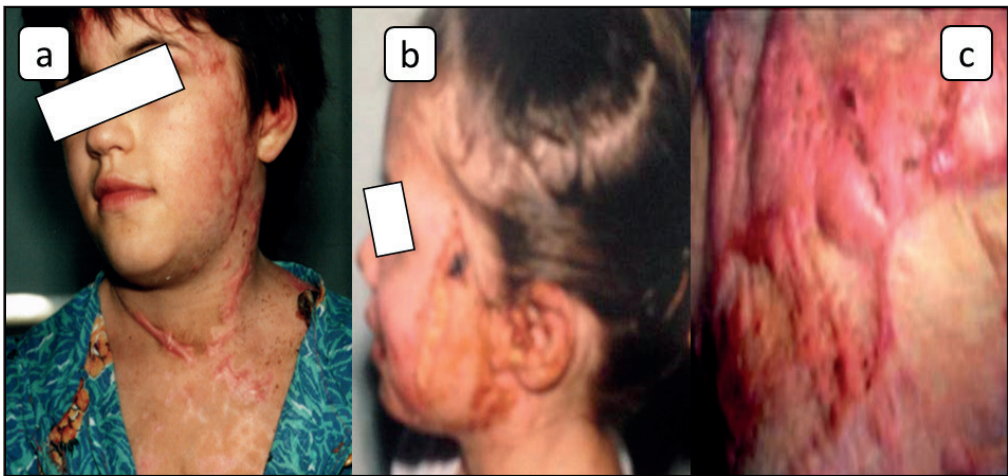
Over the past 5 years, at the surgical department of Poltava Children's City Clinical Hospital, we have treated 78 patients aged 6 months to 15 years, with isolated burns to the face and neck, as well as those whose lesions were combined with burns of other anatomical areas. At the time of hospitalization, the clinical

diagnosis was determined according to the generally accepted classification and standard classical examination methods were used in dynamic observation, and the "rule of nines" adapted for each age group was used to establish the area of burns [12].

Comprehensive treatment of children was performed in conjunction with a combustiologist according to the protocols



**Fig. 3.** Electrscal injuries of the upper and lower lips



**Fig. 4 (a-c).** Type of hypertrophic post-burn scars

**Table I.** Distribution of patients with burns depending on age

№	Age groups	Amount of patients	
		absolut	%
1	Infants – from 1 month to a year	4	5,1%
2	Nursery - from 1 to 3 years	27	34,6%
3	Preschool - from 3 to 7 years	17	21,8%
4	Primary school - from 7 to 12 years	19	24,4%
5	Senior school - from 12 to 15 years	11	14,1%
Total		78	100%

**Table II.** Distribution of burns depending on anatomical localization

№	Parts of the body	Amount of children	
		absolut	%
1	Face and neck	21	26,9%
2	In combination with the chest	12	15,4%
3	In combination with the chest and abdomen	15	19,2%
4	In combination with the chest, abdomen and upper limbs	18	23,14%
5	In combination with the upper and lower limbs	4	5,1%
6	In combination with other anatomical areas	8	10,3%
Total		78	100%

of medical care for patients with burns and their consequences, taking into account the location, severity and area of lesions which were located directly at the head, neck and in oral cavity. Particular attention was paid to the volume of preventive and rehabilitation measures that were planned to be carried out after discharge from the hospital. The possibility of medical, social, psychological and emotional adaptation for children at the place of residence was taken into account. Also, into account were taken the nature of family relationships, the level of material well-being and the possibility of access to rehabili-



**Fig. 5 (a, b).** Tracheostomy due to complex conditions caused by burns of the skin, oral mucosa, upper respiratory tract and severe general somatic condition

tation measures [12]. Statistical processing of absolute digital data was performed according to generally accepted standards.

**RESULTS**

A comprehensive analysis of the content of 621 thematic case histories revealed that 78 cases (12.6%) accounted for facial burns. Isolated lesions of only the soft tissues of the maxillofacial area were observed in 21 children (26.9%) - (Fig. 1 a - e). Combined burns, which affected other anatomical areas, accounted for 57 patients (73.1%) - (Fig. 2 a - e).

The most frequently affected were children of nursery, primary school and preschool age. To a lesser extent, this applied to infants and senior school children. The distribution of patients with burns depending on age is presented in Table I.

Depending on the place of residence, patients from rural areas accounted for 41 observations (52.6%), and in 37 cases (47.4%) they were urban residents. Among them there were 53 boys (78.0%) and 25 girls (32.0%).

The distribution of burns depending on the anatomical location is presented in Table II. The data given in Table II show that most often burns of the face and neck were combined with lesions of the chest, abdomen and upper



limbs (23.1%); of the chest and abdomen (19.2%) and only of the chest (15.4%).

At the time of seeking of medical help, all patients and their relatives complained of burns in one or another part of the body, acute pain, excitement of children, which was accompanied by crying, screaming, increased motor activity. The nature of the lesion determined the degree of involvement of peripheral nociceptive receptors, which identify the intensity of pain and features of the psycho-emotional state. However, in this case, individual characteristics also had a certain influence.

The anamnesis of the disease revealed, that the causal factor of thermal burns in 47 children (60.2%) was in a result of personal misbehavior and reckless actions, in 12 children (15.4%) it happened by accident and did not depend directly on their participation. Unfortunately, in 14 patients (17.9%) the cause of thermal injuries was boiling water or very hot water, in the vast majority due to neglect of relatives or accidental coincidence. Electrotrauma of the upper and lower lip with their partial necrosis (Fig. 3) was the cause of burns in 2 cases (2.6%) and 3 cases (3.8%) were in result of casuistic reasons. It should be noted that in 3 children (3.8%) of victims there was a delay in mental and physical development. The distribution of the frequency of burn injuries depending on the place of its receipt was quite diverse - from the domestic conditions to the explosion of combustible substances in the vehicle. There is also a clear relationship between the location of accident and the age of child. If in the younger age groups it was more often related to domestic conditions, then in the older age groups it was associated with increased mobility and ambition of children, and burns more often occurred outside the home.

Regarding the clinical characteristics of thermal burns, it should be noted that patients with first-degree burns, which are characterized by redness of the skin and pain, we did not meet in hospital. In second-degree burns in 59 people (75.6%) due to exfoliation of the epidermis under the action of a thermal agent, blisters with a clear yellowish liquid were formed. In the absence of infection, these burns healed within 14-16 days, and this process resulted with epithelialization of the affected area. In 4 patients (6.8%) the course of such burns was complicated by suppuration of the wound surface. There were 19 patients (24.4%) with burns of IIIA and IIIB grades, and their clinical manifestations and results of treatment depended on the depth of the lesion. According to our short-term and long-term follow-up of patients, complete recovery of the skin was observed in 12 children, i.e. they had III A degree of burns, and in 7 patients on 18<sup>th</sup>-21<sup>st</sup> day of treatment there was healing of the burn surface with scarring. In 4 of 7 these patients, had the appearance of hypertrophic scars and in 3 patients were observed the formation of keloids (Fig. 4 a - c), which required further surgical treatment to replace the scar by transplanting a free flap of skin in two such patients. All hypertrophic post-burn scars underwent of the conservative treatment during the rehabilitation stage. Unfortunately, in one patient, surgical treatment could not be performed due to the large area of the keloid. We did not observe burns of grade IV on the face and neck, but in 6 patients (7.7%) it were followed by a combined location on the upper and lower limbs.

Treatment of all cases was carried out in accordance with the protocol of medical care for this category of patients, tak-

ing into account of the age of patients, the area of the lesion, and the severity of the burn, the nature of its healing and total somatic condition.

Pre- and intraoperative psychoemotional stress in 51 children (65.4%) was the cause of efferent vegetative reactions of varying severity, especially with the use of inadequate type of analgesia. This situation required measures to eliminate these stresses through the use of sedative, antihistamine and analgesic drugs, which simultaneously played the role of premedication.

Special difficulties arose when it was necessary to intubate the trachea - 15 cases (19.2%), in a cause that the combination of burns of the skin, mucous membranes of the mouth, nose, pharynx, larynx, tracheobronchial tree and significant swelling of the vocal cords made it difficult to perform direct laryngoscopy and intubation. However, in 8 children, incubation was performed according to the classic version, in 4 observations - this was done using a bronchofibroscope and in 3 cases - had to impose a tracheostomy due to difficult conditions, caused by burns of the skin, oral mucosa, upper respiratory tract and severe general somatic condition (Fig. 5 a - b).

Takin into account the possibility of distortion after thermal burns, it is necessary in the early stages of treatment to take care of the cosmetic effect of treatment, ensuring the return of the child to a full life, providing of the moral support, restoring physical and psychological health. These tasks require the development of an individual program of effective rehabilitation. However, the survey of relatives of the patient revealed that only 83.3% of them expressed interest in this issue, and only 47.4% of them are ready to follow these recommendations without fail. The main obstacle to this was the lack of medical facilities that can provide specialized medical care and such specialists as a rehabilitologist, psychologist, psychotherapist at the place of residence. In addition, in 82.1% of cases, this applied to rural residents, which did not allow for rehabilitation measures in full and significantly reduced the process of social adaptation and their quality of life.

## DISCUSSION

Unfortunately, it is not possible to have a comprehensive discussion on this issue due to the availability in the periodical literature only isolated data, which concerning regions with different levels of industrialization, the presence of concomitant lesions of other anatomical areas and mainly about adult patients. If the publications are directly related to children, it is mainly devoted to the treatment of critically patients with burns and intensive care. As our research has shown, the frequency and structure of burns largely depends on the level of sanitary-educational work in organized children's groups and direct awareness of the children and their relatives. It is not always possible to carry out comprehensive rehabilitation of patients and to trace the long-term consequences of reasons beyond our control.

## CONCLUSIONS

As a rule, thermal injuries in children occur due to high temperatures, but facial burns can be caused by a small effect of temperature factor. This injuries quite often accompanied by severe functional and anatomical disorders, which can lead

to distortion of areas of the body that have been exposed to high temperatures. Defects and scarring deformations, which occur after burns of the face and neck, significantly complicate of the restorative treatment, and the area of the burn surface and its depth determine the types of scars. Quite often, it is accompanied by inversion of the eyelids, lips, strictures of the nasal passages, lesions of the skin and cartilaginous areas of the nose and auricles, which requires a complex multi-stage plastic replacement of damaged tissues. Therefore, in order to prevent such consequences, it is necessary to pay attention to preventive measures, sanitary-educational work at all levels of society with the involvement of administrative resources. In addition, in such children with all types of scars, especially with keloid and hypertrophic scars, as they can lead to post-burn contractures, special attention should be paid to the features of rehabilitation, taking into account the capabilities of medical institutions.

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## Conflict of interest:

*The Authors declare no conflict of interest.*

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